Notes on Some of the British Nepticulidae

By Lieut. Col. A. M. Emmet, M.B.E., T.D., M.A., F.R.E.S.

(Continued from p. 142)

So we come to the larvae. The larva of *ignobilella*, by consent of all authorities, is yellow, but there is lack of agreement about the colour of the larva of *hybnerella*. Stainton said it was yellow; Fologne (1862) said it was yellow, but figured it as dull green; Wood said it was green, but we now know that he was describing *crataegella*. More recent British authors have said it was green, but they were following Wood's false scent; Hering said nothing; Carolsford-Krausé (1961) said it was yellow and took Wood severely to task for doubting Stainton's word; lastly Borkowski (1969), the most recent authority says it is green when seen in the mine (Larva hellgrünlich, wobei der Einfluss des durch das Blatt fallenden Lichtes zu beachten ist). For my part, I have bred *hybnerella* from apparently yellow larvae and have checked the determination of the imago by dissection of the genitalia. I have also bred (as I believe) *ignobilella* from larvae which I have not been able to distinguish from *hybnerella*.

This brings us to the imagines. The wing-pattern rof the two species seems to be so alike as to be indistinguishable. The colour of the head is the conventional means of determining the two, the text-books saying that *ignobilella* has a red head and *hybnerella* a black one. Wood, as we have seen above, said that the female *ignobilella* had a black head. Later writers have been rather coy about this. Some, like Waters, have accepted Wood's statement; others, like Meyrick, have ignored it: none, to my knowledge, has refuted it. I submitted five red-headed neps bred from hawthorn-feeding larvae (not *regiella* H.-S.) to Dr Bradley at the British Museum, and after examining the abdomen and frenulum of each under a microscope, he pronounced four to be females beyond doubt, and the fifth to be almost certainly of that sex—the reverse of Dr Wood's experience. My moths were reared from a batch which had also produced black-headed, genitalia-attested male *hybnerella*. The series of *ignobilella* in the British Museum consists predominantly of red-headed moths; all those determined by Lord Walsingham are of this form. There is also, however, a smattering of black-headed specimens contributed by foreign collectors. What we need to know, therefore, is whether *ignobilella* always has a red head and *hybnerella* a black one, or whether the colour of the head is mixed in one or both of these species, and, if so, whether the variation depends on sex.

Part of the problem is that (as far as I know) the female genitalia have not yet been examined and figured. For this reason I saw no point in dissecting my red-headed female moths, for we still would not have known to which species

they belonged. If any collector takes a pair of either species *in cop.* (many neps perform this act on tree trunks), it would be valuable to dissect the genitalia of the pair, so that we may associate the female genitalia with the correct male.

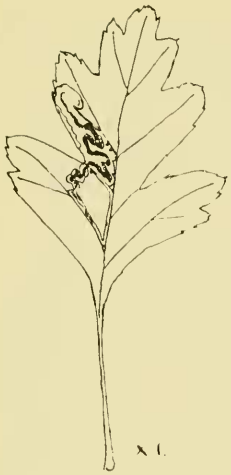
Much more work has been done on these species on the continent than in this country, but abroad *ignobilella* appears to be rare. Borkowski states that he has not yet bred the imago, and Dr Klimesch has asked me to send him cocoons as the species is not yet represented in his collection. Its commonness in Britain is based on the assumption that all redheads are *ignobilella*.

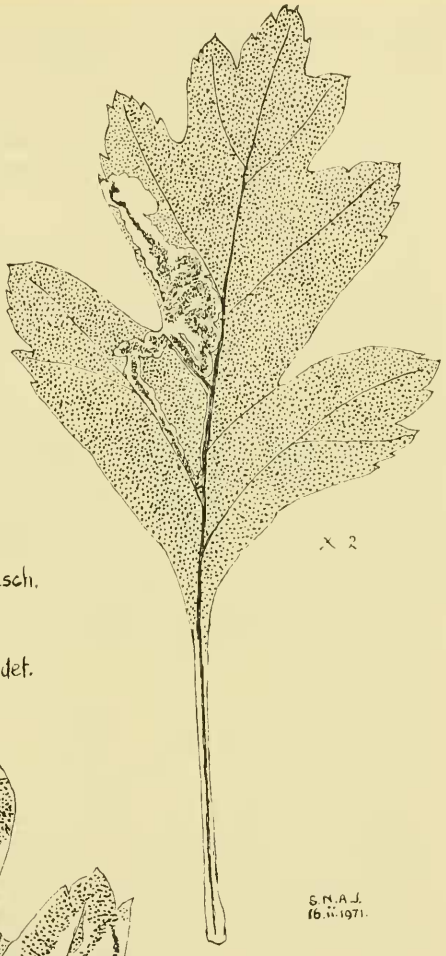
The male genitalia of the two species are distinct, and they can be separated at once by the shape of the *jugum*. This difference led Beirne (1945) to place *hybnerella* in the genus *Stigmella* and *ignobilella* in *Nepticula*. But Stainton recognised the two species as different before the genitalia had been examined. Did he rely solely on the colour of the head, or had he some criterion of differentiation which we have now lost? Carolsford-Krausé (1961) writes of this group, "the only sure way to tell such species apart is by examination of the genitalia" and Dr Klimesch (*in litt.*) expresses the same opinion in almost the same words.

So there we must leave this problem still unsolved, and proceed to the last mistakes which have landed us in such difficulties.

This surrounds the larva of *Stigmella oxyacanthella* Stt. (species D). While the imagines of the previous species are as alike as three peas (apart from specimens which have redheads), there is no mistaking *oxyacanthella* which is unicolorous purplish fuscous without a fascia on the forewing. It is the larva and mine which have been confused. The trouble started early, for Stainton (1855) figures the mine and larva of *crataegella* and ascribes them to *oxyacanthella*. In his herbarium there is a folder of hawthorn-leaves labelled "*N. oxyacanthella*, 6/8/54"; all the mines, in my opinion, are those of *crataegella*.

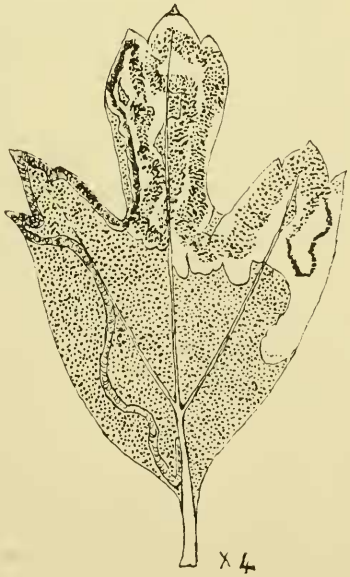
Once more, we have Wood to thank for sorting out the trouble. He writes (1894, p. 2): "Some doubt has been thrown on the existence of *gratiosella* as a good species, mainly from the circumstance that it has been given the larva of an allied species, whilst its own larva seems to have done duty for a presumed summer brood of *oxyacanthella*. It was noticing the very pale head of this summer-feeding larva that first made me question its identity with the dark-headed larva which occurs late in the autumn, and which I knew beyond dispute to be the larva of *oxyacanthella*. Suspicion once aroused, other differences that had been overlooked or misunderstood before became apparent, until the conviction could no longer be resisted that two very similar larvae and equally similar mines had been mixed together as one. Subsequently, the breeding of the perfect insect completely settled the point, and proved that the green larva with the colourless head,





Stigmella crataegella Klimesch.
Bournemouth Hampshire.
S.C. Scarsdale Brown leg et det.
13/15.viii.1970.

S.N.A.J.
16.iv.1971.



feeding on hawthorn leaves in July, belonged to *gratiosella*". I must remind readers that where Wood has written *gratiosella*, they should now substitute *crataegella*. This passage seems to me to clear the matter up completely, but until I had read it, I certainly used to confuse the two species of larvae, and I do not imagine that I was alone in doing so. Our text books still attribute a summer generation of larvae to *oxyacanthella*, and that, perhaps, is the root of the trouble; but I shall return to that point later.

One species remains, and then I shall have done with this part of my story. *Nepticula pygmaeella* Haw. (species E) is only on the fringe of this comedy of errors. Like *oxyacanthella*, it has an imago which is distinct. The larva, too, can hardly be mistaken. It is after the larva has gone that the trouble begins. For the vacated mine is so like that of *crataegella*, and *crataegella's* mine is so like that of *oxycanthella*, that errors of identification are almost inevitable, and records based on vacated mines must be treated with caution.

We now come to the dichotomous table of the mines of the hawthorn-feeding Nepticulidae. Here we must feed in the three species which hitherto I have not mentioned, *Stigmella paradoxa* Frey (*nitidella* Hein.), *S. regiella* H.-S. and *Dechtiria atricollis* Stt. The table will, I hope, make the determination of tenanted mines a matter of ease and certainty, except in the case of that obstinate pair, *ignobilella* and *hybnerella*.

1. Mine starting as a gallery which generally develops into a blotch 2
— Mine not starting with a gallery. Blotch on lobe of leaf with a dark central mass of frass. Larva greenish white, head dark brown ..... *paradoxa*
2. Gallery widening into a blotch 3
— Gallery not widening into a blotch, but long and erratic, with frass arranged in arcs of often separated grains. Larva bright green, head blackish or dark grey ... *oxyacanthella*
3. Linear feeding continued throughout. Blotch formed by gallery looping back and fusing with its earlier course ... 4
— Linear feeding not continued throughout. The gallery ends abruptly, the blotch being formed by radial feeding 5
4. Egg on underside, either on the frill of the leaf-stalk, when the gallery follows the lower edge of the leaf, finally turning back on itself to form a small blotch; or on midrib when the gallery and blotch are usually small and compact, staying close to the point of origin. Frass in arcs. Larva green, head whitish brown ..... *crataegella*
— Egg on upperside. Mine similar to *crataegella*. Larva yellow ..... *pygmaeella*
5. Early gallery not strictly following margin of leaf and containing a fine unbroken line of black frass, leaving clear margins 6
— Early gallery following leaf margin, with frass not dis-

posed in fine central line 7

6. Frass line at the start of the mine broader, filling more than half the track. Subsequent blotch at the edge of the leaf. Larva yellow ..... *ignobilella*

— Frass line at the start of the mine narrower, filling only one hird of the track. Blotch often in the centre of the leaf. Larva greenish yellow ..... *hybnerella*

7. Frass in gallery along leaf margin black, deposited in blobs or separated grains. Blotch large with irregular frass. Larva whitish green with darker dorsal vessel. Head and ventral spots on thoracic segments dark brown (larva mines venter uppermost) ..... *atricollis*

— Frass in gallery along leaf margin red. Frass in blotch black in a loose central line. Larva yellow, head light brown ..... *regiella*

Other common lepidopterous leaf-miners on hawthorn include *Bucculatrix crataegi* Zell., which makes, in its first instar, a very short gallery close to the midrib; *Lyonetia clerckella* L., which makes a long sinuous gallery with a thin central line of frass; and *Leucoptera scitella* Zell., which makes a large blotch with the frass arranged in spirals in the centre of the blotch.

I shall now treat each of these species of *Nepticula* in turn, taking them in the order in which they occur in the table, which is as convenient as any other arrangement.

Stigmella paradoxa Frey (*nitidella* Hein.) (see Emmet 1970). *S. paradoxa* had a good year in 1970. In 1969, when I first found it, I was almost too late for the larvae, but from the few cocoons I secured, a single imago emerged on the 24th of April. Those who are unfamiliar with these tiny moths have little conception of the speed with which they run: by comparison, *tragopoginis* is a laggard. I must have spent nearly half an hour that evening in an unavailing attempt to catch the *paradoxa* in a glass tube, and decided that Frey so named it because it always does the unexpected; though at the same time I saw the aptness of Heinemann's appellation, for its shining wings gleamed and flashed as it weaved and bobbed in its efforts to escape. The next morning I tried again and at last succeeded in trapping it.

I paid a brief visit to Wicken Fen on the 10th of May and searched the trunks of the hawthorns on which I had found the mines in the previous summer. I saw, as I thought, only one *paradoxa,* but on tubing it, I found I had two—a pair in cop. One of these died in the ammonia with its wings folded like a butterfly over its head, and I set it rather badly as a result; the other is a very good specimen. However, I decided that the bred specimen, as historically the most interesting, was the one to give to the British Museum, although it had suffered, but not too badly, in the chase I have described.

I have little time for entomology in June and July, but I felt that at all costs I must visit the Fen to collect *paradoxa.* So I made a flying visit on the 28th of June, just thirteen days

earlier than the date on which I had discovered the species in 1969. There were mines in profusion, but it was at once apparent that I was too late. With no time to be selective, I picked about a hundred mines. On my return home I found that barely a dozen of these were still tenanted, and most of these larvae were obviously parasitized. In the end I obtained only four cocoons for my labours. It would seem, therefore, that mid-June is the time to look for the larvae. My four cocoons all produced parasites, of three different species.

The following is a brief account of the biology of *paradoxa*:

Ovum—dark and shiny; laid on the underside of the leaf about one millimetre from the tip of a lobe.

Larva—glossy greenish white, with the head dark brown. When not feeding it tends to rest in the central blob of frass and then is hard to see.

Cocoon—reddish purple. I have not yet examined the pupa.

Imago—expanse, 5-6 millimetres. Head, light orange. Eyecaps cream. Antennae, shining bronze-brown. Collar, as head, but scales paler at their tips. Thorax, bronzy brown. Forewing, unicolorous glossy bronze-brown except for a hint of purple at the extreme apex. Hindwings, light grey.

Of the other British Nepticulidae that I am acquainted with, *paradoxa* seems most nearly to resemble *S. viscerella* Stt., but the head is brighter orange, not being mixed with fuscous, the eyecaps are paler and the wings are much more glossy.

I made some unfortunate errors in the account I gave of the distribution of *paradoxa* in my article of 1970, owing to my mistaking for it the old, discoloured mines of *Leucoptera scitella* L. When *scitella's* mines are situated on the lobe of a leaf and age has obliterated detail, they look very much like those of *paradoxa*. The position of the egg will, however, resolve doubts, for *scitella's* egg is laid well away from the leaf-margin whilst *paradoxa's* is right at the tip of the lobe. Cambridgeshire records for *paradoxa* from Wicken Fen and Cherry Hinton are correct, and to these I can now add Chippenham Fen. The record from the Burren, Co. Clare, is likewise valid. My records from Essex and Kent were, however, mistakes and they must be cancelled.

In my previous article I suggested that *paradoxa* had long been present in Britain, but had remained undetected until a population explosion led to its discovery. This view is supported by an interesting find which I made in Stainton's herbarium. It contains a single hawthorn leaf bearing a mine of *paradoxa* but labelled *"N. pulverosella"*. The error in identification need occasion no surprise or reproach. Apple and hawthorn are closely related foodplants and we have one species of *Nepticula, Dechtiria atricollis* Stt. which feeds on them both. *Pulverosella* makes a blotch at the edge of an apple-leaf, and when Stainton found an unknown species

making a somewhat similar blotch at the same time of year at the edge of a hawthorn-leaf, he jumped to a reasonable though faulty conclusion. There are no data for Stainton's leaf. It was probably collected in the 1850's quite possibly before Frey named *paradoxa* in 1857. Stainton's herbarium contains a few mined leaves expressly stated to be of foreign origin; the absence of such a statement in this instance is indicative (but not conclusively) that the mine was taken in Britain.

S. oxyacanthella Stt. The larva and mine are so admirably described in the passages I have quoted from Wood, that I have nothing to add on that score. There is, however, disagreement amongst our authors on whether *oxyacanthella* is bivoltine, as Stainton, Tutt, Meyrick and Ford maintained, or limited to a single autumn generation, as was contended by Wood and Waters, our most authoritative writers on the Nepticulidae. Both Hering (1957) and Borkowski (1969) state that it is double-brooded on the continent, and one would therefore expect it to have a similar regime in this country. On the other hand, *oxyacanthella's* mine has so often been confused with that of *crataegella* that our summer records for the larvae are suspect. Stainton, as we have seen, confused the two species, so his testimony is worthless, and our other authors may well have followed his lead. For the moment I prefer to reserve judgement, but if I had to commit myself, I would back Wood and Waters.

S. crataegella Klim. Here again, after quoting Wood in full, I need give no further description of the mine and larva. I wish I could say something of value regarding the appearance of the imago, but I have not yet bred or taken this species myself, and I regard all black-headed hawthorn-feeding Nepticulidae in our collections with the gravest suspicion. The most authentic series of *crataegella* are, I suppose, Dr Wood's bred series of "*gratiosella*" in his collection in the British Museum.

It seems that *crataegella* is a difficult species to rear. Waters knew the larva well, under the name of *gratiosella*, but it was one of the few *Nepticulas* with which he was consistently unsuccessful. Wood was more skilful, and he tells us later on in the article from which I have quoted that the pupa is subterranean. The secret must be to provide it with earth of the right consistency and humidity. I had quite a number of larvae last summer, which I then thought were *oxyacanthella;* I provided them with moss and tissue for pupation purposes, so I am unlikely to get any imagines.

Hering (1957) says that *crataegella* is univoltine, the larvae appearing in mid-summer. This is consistent with the observations of Wood and Waters. What other writers have to say about *gratiosella* is of no validity, for we cannot tell whether they are referring to *crataegella* or *hybnerella.*

It seems that *crataegella* is a rare species on the continent, being confined to a few localities in central Europe. On the

other hand, it appears to be common in Britain, though its distribution needs to be worked out. Wood had it from Herefordshire, Waters from Oxfordshire, Berkshire and Buckinghamshire, Mr Brown from the Bournemouth district, and I from Essex and Cambridgeshire, these records having been made from mines and larvae, without the moth being bred. I also have a mine found vacated in August 1969 in west Galway. Previously I had ascribed it to *oxyacanthella*, but now I feel sure it is *crataegella;* however, further confirmatory examples are desirable before this species is added to the Irish list.

Nepticula pygmaeella Haw. I have nothing of significance to add about this species. It is double-brooded with the second generation appearing to be the more plentiful.

N. ignobilella Stt. and *S. hybnerella* Hübn. I am dealing with these species together, because of the uncertainty of the distinction between them. The larvae tend to appear earlier than our text-books tell us. Meyrick and Ford give July for the first generation, but in mid-June last summer, vacated mines were already a common feature of the hawthorn hedgerows in north Essex, though I continued to find larvae for another month. These tiny moths occur in prodigious numbers. Between mid-June and mid-July I established a routine of searching the short stretch of hawthorn hedge in our garden on alternate days, and I seldom picked fewer than seventy mines a time; sometimes the number exceeded a hundred. I kept no exact figures but there were roughly three *hybnerella/ignobilella* to one *crataegella*, no other species being present; the *crataegella* mines tended to occur later than the others. So quickly do the larvae feed up at this time of year (Hering, 1951, p. 76, writes: "It has been reported that *Nepticula malella* Stt. required only 36 hours from the commencement of hatching from the egg until spinning its cocoon", though he is rather sceptical about the accuracy of the observer in this instance), and so much more conspicuous does the mine become after the larva has left, that it was a good day if more than half a dozen of the mines which I found were still tenanted, and many of these would be parasitised. In all, I reared ten months, five with red and five with black heads. The second generation also comes early and in 1970 was over in September, before the autumn feeders such as *regiella* and *atricollis* had put in an appearance.

Until *hybnerella* and *ignobilella* are distinguishable with more certainty, it is difficult to say much to the purpose about their distribution. Tutt (1899) wrote of *"gratiosella"*, "So much confusion has existed between this species and *N. ignobilella* owing to the mistake about the larva in Stainton's manual, that possibly most records are unreliable". Poor man, he was doing nothing to clear up the confusion, for, through his following Wood's false scent, it seems that it was he, and not Stainton, who was at fault. Records made in the

present century are even less reliable, since reports of *hybnerella* will most likely refer to *crataegella*.

Dechtiria atricollis Stt. I shall also discuss this species under the head of another of its foodplants, *Malus*. I know a locality in Kent where ornamental crab-apples and a hawthorn hedge are in juxtaposition, and a vigorous colony of *atricollis* extends to them both. There is a close similarity in the formation of the mine in each tree, but whereas in apple the mine often extends at length along the leaf margin, in the smaller hawthorn-leaf it turns back on itself and is more compact.

Although the authorities, other than Meyrick (1928) say that *atricollis* is bivoltine, I have never found larvae except in the autumn, when they are abundant in many localities. Early October is the best time to look for them. This is a hard species to breed, and I have not yet been successful. Tutt (1899, p. 171) says that it hibernates as a larva and leaves its hibernaculum to spin its cocoon in the spring. He adds: "Many failures to breed species having this habit may be due to the fact that the vessels in which their mines are kept are not tightly closed in the spring, and that the larvae wander away to pupate, rather than to the normal explanation that the larvae or pupae have dried up". At the time of writing (April) I have a living larva that overwintered in its mine.

Stigmella regiella H.-S. The reddish colour of the frass in the gallery phase, and the course of the gallery along the margin of the leaf, are constant characteristics which make the determination of this mine easy. The species is bivoltine, with the commoner autumn generation continuing throughout October and sometimes into early November.

The End of a Decade

By T. W. Harman

1970 saw the end of my first decade as a serious lepidopterist. Besides making some observations about the lepidoptera seen in 1970, I should like to make a few general comments on the entomological scene and the field of conservation as I see it.

First, the year 1970 from the point of view of lepidoptera. The season began in earnest on 18th March when Mr B. Elliott and myself visited a Hampshire locality to search for galls of *Aegeria flaviventris* Staud. on the stems of sallow bushes. We collected about fifty promising-looking stems and the result was four moths later in the season. In this locality we saw a Water Rail at very close range, the first live bird of this species either of us had seen. The following day we visited a Chiltern locality to obtain stems of Wayfaring Tree containing the early stages of *Aegeria andrenaeformis* Lasp. This proved very hard work and many of the signs seemed to be old. It would appear this insect must be declining, as another spot which yielded